

Oceanography from Space in the 1990s

Paper to be presented at 7th Australasian Remote Sensing Conference (Pacific Ocean Remote Sensing Conference (PORSPEC '94)), 1-4 March 1994, Melbourne, Australia

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Verbal Presentation

During the 1990s, the good news is that the space agencies of Canada, Europe, Japan and the United States will launch a constellation of ocean-related satellite missions. An important change is that NASA is no longer the only nor the prime player; bi- or multi-lateral agreements are the wave of the future. All the major oceanography interests will potentially be receiving "more-or-less" continuous data through the 90s and into the next century. These space-based oceanography missions will collect global data that will be used to study ocean physics, air-sea interactions, marine meteorology, biological processes, sea ice, and their broad range of interdisciplinary problems. These ocean satellites have been planned to overlap in time and space with two major field programs, the World Ocean Circulation Experiment and the Tropical Ocean - Global Atmosphere program. Together, these satellite missions and in-situ experiments will provide the international science community with a bonanza of unique data. The resulting scientific studies are sure to provide a revolutionary new understanding of the Earth's ocean-atmosphere-cryosphere-biogeochemical climate system.

Measuring near-surface vector winds over the global oceans, a scatterometer is already collecting data from a C-Band sensor on board the European Space Agency's (ESA) ERS-1 spacecraft. ERS-2 will be followed by ESA's ERS-2 in ~1994. Next to fly will be NASA's Ku-Band Scatterometer (NSCAT) aboard the National Space Development Agency's of Japan (NASDA) ADIOS satellite in 1996. ADIOS will be followed in the late 1990s by ADIOS-2 with the possibility of carrying another scatterometer sensor. Thus, if all goes as presently planned, oceanographers and meteorologists can look forward to a decade of scatterometer measured vector winds over the global oceans.

The flight of altimeters for ocean circulation studies have begun with ESA's ERS-1; which was recently joined by the joint US/France NASA/CNES TOPEX/POSEIDON advanced altimetric mission which was launched on August 10, 1992. Next, will come ESA's ERS-2 in late-1994. Beginning in ~1996, the US Navy plans to launch the first of two GEOSAT Follow-On altimetric missions. Beginning in the late-1990s, NASA, NOAA, and CNES are considering sponsoring a series of TOPEX/POSEIDON-class missions. The overlapping in time of altimetry and scatterometry missions will allow studies of the ocean circulation and its primary driving force, the surface winds.

For sea ice studies, a variety of Synthetic Aperture Radars (SARs) are planned. ESA's ERS-1 carries a C-Band SAR. In mid-1992, NASDA launched JERS-1 which carries a L-Band SAR. Next will be ESA's ERS-1 follow-on, ERS-2, in 1994. In 1995, Canada's RADARSAT will fly another C-Band SAR. At the end of the decade, ESA plans to fly

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another C-Band SAR. During this decade, the passive microwave SSM sensor on board the DMSP satellites will also be collecting ocean and ice data. During the 1990s, polar oceanographers will have an unprecedented day-night, all-weather view of the ice-covered oceans.

An ocean color sensor for the study of ocean productivity will be flown on board the US Sea-WiFS mission beginning in 1993. Sea-WiFS will be followed by the OCTS (Ocean Color Temperature Sensor) on board the two NASDA ADEOS spacecrafts in 1996 and the late-1990s. Also, JCSA will fly the MERIS sensor in the late 1990s. These measurements of ocean productivity studied in concert with altimetry and scatterometry data and sea surface temperatures measured from the NOAA operational satellites will allow important studies of the thermal and biological response of the upper ocean to wind forcing and ocean circulation.

The message here is clear - through the 90s and into the beginning of the next century, we are going to inundated with ocean data from space. From the modest beginnings of the late 70s through the 80s - Seasat, Nimbus-7, Geosat, DMSP/SSM, and the NOAA operational birds - the hard work of the international ocean science community has resulted in the Canadian, European, Japanese, and US space agencies approving many ocean sensors for the next generation of Earth orbiting spacecraft. For oceanographers, this will be a busy and exciting decade of "Oceanography from Space."